

Project Title: **Staging, Storage, Sizing and Treatment Facility (SSSTF)**
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SECTION 15400--PLUMBING AND SERVICE PIPING

PART 1--GENERAL

SUMMARY:

Section Includes: Work includes, but is not limited to:

Interior plumbing systems (fixtures, supply, drain, waste and vent piping, service water heating system, safety devices, and appurtenances) up to 5 ft beyond the building exterior wall. Upon completion of the piping system installation, the Subcontractor shall operate and test as specified hereinafter to verify that the systems are properly installed and operate as required.

REFERENCES:

**AMERICAN SOCIETY OF MECHANICAL ENGINEERS/AMERICAN NATIONAL
STANDARDS INSTITUTE (ASME/ANSI)**

ASME/ANSI B31.9	Building Service Piping
ANSI B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM)

ASTM A53	Standard Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A216	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
ASTM A234	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for moderate and high Temperature Service
ASTM B61	Standard Specifications for Steam or Valve Bronze Castings
ASTM B62	Standard Specifications for Composition Bronze or Ounce Metal Castings
ASTM B88	Standard Specifications for Seamless Copper Water Tube

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AMERICAN STANDARDS ASSOCIATION (ASA)

ASA B2.1 Dimensional Standards for Pipe Threads

UNIFORM PLUMBING CODE (UPC)

UNIFORM MECHANICAL CODE (UMC)

UNDERWRITERS' LABORATORIES, INC. (UL)

SUBMITTALS:

See Vendor Data Schedule.

TBD

QUALITY CONTROL:

Qualifications: Piping and plumbing shall be furnished and installed by a firm qualified, accredited and regularly engaged in this type of work, and shall maintain shop and facilities for fabrication and maintenance of subject equipment.

Items of Any One Classification: Items which are used in quantity, such as valves, specialties, accessories, fittings, etc., shall in each case be the product of one manufacturer, and shall be used only for the services recommended by the manufacturer.

Materials, Products and Equipment: Materials, products and equipment shall be first quality and be furnished and installed in strict accordance with the subcontract drawings and these specifications.

PART 2--PRODUCTS

GENERAL:

All materials, products and equipment shall be as manufactured by the manufacturer specified in this section, or approved equal.

PIPE AND FITTINGS:

Copper (NK) Piping and Fittings:

Service: Potable Water Piping (CW), underground less than 2" diameter.

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Piping: Piping shall be seamless copper water tubing, hard drawn or soft drawn, type L or K straight length or coil, in accordance with ASTM B88.

Fittings: Fittings shall be wrought copper or bronze brazing – type pressure fittings, in accordance with ANSI B16.22 for less than 2" diameter.

Gate Valves: Valves shall be 125# class, bronze, double wedge rising stem screwed-in bonnet, brazed joint tubing end in accordance with ASTM B62.

Globe Valves: Valves shall be 150# class, bronze, renewable composition disc, rising stem, union bonnet, brazed joint tubing end in accordance with ASTM B62.

Carbon Steel (NN) Piping and Fittings:

Service: Raw Water (RW).

Piping: Piping shall be carbon steel schedule 40 in accordance with ASTM A53.

Fittings: Fittings shall be seamless wrought carbon steel BWE, SCH 40 in accordance ASTM A234.

Gate Valves: Valves shall be 150# class, bronze, cast iron, or malleable iron, SCRD, OOS&Y, BB Standard Trim, Grafoil packing and gaskets in accordance with ASTM A126, ASTM B61, and ASTM B62.

Ball Valves: Valves shall be 300# class, cast steel body, SCRD, or SW 316 SST ball and Stem, CS packing retainer and gland, TFE ball seat, Grafoil seal ring and stem packing in accordance with ASTM A216.

FIXTURES, FITTINGS AND TRIM:

Products shall be of the manufacturer set forth below, or approved equal:

Water Closet: TBD

Urinal: TBD

Lavatory: TBD

Lavatory (Handicap): TBD

Service Sink: TBD

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1 Emergency Shower: TBD

2
3 Fixture Supports and Carriers: Products shall be of the following manufacturers:

4
5 Drains:

6
7 Floor Drains: TBD

8
9 Cleanouts: TBD

10
11 Valves:

12
13 Gate Valves: TBD

14
15 Globe Valves: TBD

16
17 Ball Valves: TBD

18
19 Wall Hydrant Valves: TBD

20
21 Sill Cock: TBD

22
23 SPECIALTIES:

24
25 Water Hammer Arrestors: TBD

26
27 Pressure Gages: TBD

28
29 Thermometers: TBD

30
31 Gaskets: TBD

32
33 Dielectric Unions: TBD

34
35 Hot Water Heaters: Two standard AO SMITH water heaters shall be used. One is a 10-
36 gallon, 6 kW unit and the second is a 119-gallon, 54 kW unit.

37
38 INSULATION:

39
40 Above Ground: TBD

41
42 Underground: TBD

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1 PART 3--EXECUTION

2
3 INSTALLATION OF ALL SYSTEMS:

4
5 Shall be in conformity with the applicable requirements of the applicable AWWA Code and
6 the Uniform Plumbing Code.

7
8 ACCESSIBILITY:

9
10 Items such as valves, controls, access doors, specialties, and accessories shall be installed so
11 as to be readily accessible for operation, servicing, maintaining and repairing.

12
13 PIPE LINES:

14
15 Install pipe to uniform pitches between points for which elevations are established. Use level
16 or other approved method to accomplish this. Provide bends or elbows for changes in
17 directions. One-quarter bends shall be long sweep type.

18
19 Between bends or elbows, lines shall be straight, free from irregularities, and have smooth
20 interior surfaces.

21
22 Anchorage against slippage shall be provided by means of concrete or masonry piers, tie rods
23 and pipe clamps, or other approved means. Joints shall be made accessible for inspection and
24 repair prior to testing.

25
26 Above Floor Pipelines: Above floor pipelines shall be installed in neat and orderly manner.
27 Installation shall avoid interference with work of the other trades.

28
29 Unions or flanges shall be used to install valves and equipment so as to facilitate dismantling
30 as may be required.

31
32 Increases or decrease will be required for changes in the size of pipes and fittings.
33 Bushings shall not be used.

34
35 Anchors and guides shall be provided as required.

36
37 Pipes shall be full lengths to greatest extent possible. Piping shall be cleaned of dirt, rust,
38 scale, grease and other foreign matter. Piping shall be kept clean as work progresses. Seal in
39 accordance with Underwriters' Laboratories requirements wherever piping passes through fire
40 walls.

41
42 Piping shall be concealed in finished rooms and wherever shown on the drawings. Exposed
43 piping shall be run close to other piping, walls and columns. Runs shall be as close together

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1 as possible where under ceilings, slabs, and decks. Rack piping on trapeze hangers where
2 possible.

3
4 Indicating instruments shall be installed for easy reading from operating floors or platforms.
5 If 6 ft or more above floors or platforms, set at 45° angle or with mirrors.

6
7 PIPE SLEEVES:

8
9 Install standard weight pipe for pipes passing through job cast concrete and masonry walls.

10
11 Diameters of sleeves shall not be larger than required for unrestricted expansion and
12 contraction.

13
14 Length of sleeves shall be such that when installed, they will project 2 in. above floors, and
15 be flush with finished surfaces of walls and ceilings.

16
17 PIPE JOINTS:

18
19 Brazed Copper Pipe Joints: Torch brazing of copper tubing shall be performed per the
20 application and the "INEL Weld Manual".

21
22 The brazing shall be done by torch brazing and the material shall be either face-fed into the
23 fitting, or shall be provided for in the preinserted rings in a groove in the fitting.

24
25 The base material shall conform to ASTM Specification B88, Type K.

26
27 Brazing may be done in all positions.

28
29 The surfaces of the parts to be joined by soldering shall be chemically and mechanically
30 cleaned of all oxide, grease, oil, and dirt.

31
32 Connections made to dissimilar metals shall be with dielectric unions.

33
34 Plastic Pipe Joints: Plastic pipe joints shall be made in strict accordance with written
35 instructions of plastic pipe and fitting manufacturer. The recommended materials and
36 installation equipment shall be used to make the joints.

37
38 Any leaks, revealed by the pressure testing procedure, shall be repaired at no additional cost
39 to the Operating Contractor. If necessary, back heat welds on polypropylene piping shall be
40 made to make the joints pressure tight. Leaks in piping shall be cut out and piping replaced.

41
42 Pipe Tie-Ins: When performing final tie-ins to existing or new piping which requires cutting,
43 grinding, drilling or other operations that may introduce dirt, chips, or debris into the pipe

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1 interior, expanding pipe plugs shall be installed in the pipe where possible to prevent
2 contamination spread. These plugs shall be equipped with lanyards, which extend outside the
3 pipe end to prevent the plug from being inadvertently left in the pipe. No other objects such
4 as rags, cardboard, paper, etc., shall be used in lieu of these plugs. Where it is not possible to
5 install pipe plugs, the Subcontractor shall prepare a work plan, which describes how
6 cleanliness shall be maintained. This plan shall be approved by the Contractor.

7
8 EQUIPMENT, FIXTURES, ETC.:
9

10 Equipment shall be set in place, aligned, connected, and made ready for operation.
11 Connections and required safety devices shall be installed. Initial lubrication shall be
12 provided. Controls shall be set for efficient, stable operation.

13
14 Fixtures shall be installed and supported in a safe, rigid, neat, and orderly manner. They shall
15 be free from undue stresses and made suitable for normal use. Wall mounted supports shall
16 be of the type as recommended by the manufacturer of the fixture used.

17
18 All of the above shall be protected from damage during and after installation. At completion,
19 work shall be free from tool marks, discolorations, cracks, scratches, chips and other defects.

20
21 HANGERS, SUPPORTS AND FASTENERS:
22

23 Shall be of the type best suited for the service involved and installation method
24 recommended.

25
26 Hangers shall be capable of supporting the pipe or tubing in all conditions of operation. They
27 shall allow for free expansion and contraction of the piping, and prevent stress resulting from
28 transferred weight being induced into the pipe or connected equipment. The installation shall
29 support the piping or tubing without sagging and shall be clear of the work of other trades.

30
31 Supports shall include wall brackets, riser clamps, pipe stands, rollers, insulation protection
32 saddles, pipe saddles, steel sections, and other suitable devices which may be required for the
33 proper installation of piping and tubing.

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In general, the following table shall apply for hanger spacing of steel pipe and tubing, and shall not apply where any valves, flanges, fittings, etc., create concentrated loads between supports:

Single Pipe Size (inch)	Maximum Spacing (feet)	Minimum Rod Diameter (inch)
1/4	4	3/8
3/8	4	3/8
1/2	5	3/8
3/4	6	3/8
1	7	3/8
1-1/4	8	3/8
1-1/2	9	3/8
2	10	3/8

Hangers and hanger spacing for plastic piping shall be in accordance with the plastic piping manufacturer's written instructions.

Escutcheon plates shall be provided on pipes passing through floors, ceilings, and walls in finished rooms and areas. Plates shall be of chrome plated pressed steel and be provided with concealed hinges and springs to hold position on pipes.

CLEANING AND PURGING:

All piping systems shall be flushed or purged as follows:

Water lines shall be flushed with water for 10 min minimum.

Sterilization:

Per AWWA.

PIPE IDENTIFICATION AND VALVE TAGS:

TBD

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PIPE CONTENT IDENTIFICATION LIST

<u>PIPE CONTENT AND LABEL TEXT</u>	<u>COLOR*</u>
FREON	Yellow/Black
WASTE, SANITARY	Yellow/Black
WATER, DEMINERALIZED	Green/White
WATER, FIRE	Red/White
WATER, POTABLE COLD	Green/White
WATER, POTABLE HOT	Green/White
WATER, RAW	Green/White
WATER, TREATED	Green/White

* Background Color / Letter Color

Size of Labels

<u>Outside Diameter of Pipe of Covering (in.)</u>	<u>Width of Color Band A (in.)</u>	<u>Size of Legend Letters B (in.)</u>
3/4 to 1 1/4	8	1/2
1 1/2 to 2	8	3/4
1/2 to 6	12	1 1/4
8 to 10	24	2 1/2
Over 10	32	3 1/2

(All dimensions are given in inches.)

QUALITY CONTROL TESTING:

Subcontractor Supplied Testing:

TESTS AND INSPECTIONS:

Furnish temporary connections to services and the instruments for testing. Perform the following tests and inspections in the presence of the Contractor's Representative.

Tests shall be conducted before making final connections to equipment or before applying insulation.

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1 Instruments, specialties, and equipment that may be subject to damage shall be isolated
2 during the testing.

3
4 Potable Water and Heating, and Evaporative Cooler System Piping:

5
6 The piping shall be hydrostatically pressure tested at 150 psig for 2 hrs with no loss in
7 pressure.

8
9 **FIELD QUALITY CONTROL:**

10
11 Surveillance will be performed by the Contractor's Representative to verify compliance of the
12 work to the drawings and specifications.

13
14 **END OF SECTION 15400**
15

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1 SECTION 15800--HEATING AND COOLING SYSTEM

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall furnish and install all equipment, material, supplies and perform all
8 work and operations necessary for installation of the Heating and Cooling System,
9 Ventilation Fans, and related equipment as specified herein.

10
11 REFERENCES:

12
13 The following documents, including others referenced therein, form part of this Section to the
14 extent designated herein.

15
16 AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
17 ENGINEERS, INC. (ASHRAE)

18
19 ASHRAE 15 Safety Code for Mechanical Refrigeration
20 ASHRAE 90.1 Energy Efficient Design of New Buildings except Low-Rise
21 Residential Buildings

22
23 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

24
25 NFPA 70 National Electric Code
26 NFPA 90A Standard for the Installation of Air Conditioning and Ventilating
27 Systems
28 NFPA 90B Standard for the Installation of Warm Air Heating and Air
29 Conditioning Systems

30
31 SYSTEM DESCRIPTION:

32
33 The HVAC System is a once-through system consisting of supply fans, inlet filters, heating
34 coils, unit heaters, and exhaust filters.

35
36 SUBMITTALS:

37
38 Submittals include but are not limited to the following:

39
40 Product Data: Include manufacturer's technical data for each model indicated, including rated
41 capacities of selected model clearly indicated; dimensions; required clearances; shipping,

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1 installed, and operating weights; furnished specialties; accessories; and installation and
2 startup instructions.

3
4 Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loading,
5 required clearances, method of field assembly, components, and location and size of each
6 field connection. Detail mounting, securing, and flashing of roof curb to roof structure.
7 Indicate coordinating requirements with roof membrane system.

8
9 Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate
10 between manufacturer-installed and field-installed wiring.

11
12 Controls Testing: the Subcontractor shall submit a procedure to test the HVAC system
13 operation and verify control system component operation, e.g. temperature sensors, valves,
14 speed control and correct fan operation, thermostats, cutout switches for approval prior to
15 starting of the Test, Adjust and Balance work.

16
17 Commissioning Reports: Indicate results of startup and testing commissioning requirements.
18 Submit copies of checklists.

19
20 Maintenance Data: For equipment to include in the maintenance manuals specified in Section
21 01300.

22
23 Warranties: Special warranties specified in this Section.

24
25 Control System Drawings: The control system design subcontractor shall submit complete
26 construction drawings for the HVAC control system for approval. The drawings shall
27 include layout drawings of the proposed control system; and wiring and pneumatic line
28 schematics and drawings for the thermostats, controllers, switches, instruments, panels, and
29 equipment. The drawings shall accurately show the connections of signals, air supply, and
30 power for each component, and the interconnections between the components.

31
32 See Section 01300, Submittals and Vendor Data Schedule for additional submittal
33 requirements

34
35 QUALITY CONTROL:

36
37 Installer: Firms with successful installation experience on projects with heating and cooling
38 systems similar to those required for this project.

39 Comply with ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning
40 Engineers) rating and installation recommendations, except as otherwise indicated.

41
42 Fabricate, install and provide refrigeration systems to comply with ASHRAE 15.
43

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1 Comply with NFPA 90A

2 Comply with NFPA 90B

3
4 Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1.

5
6 Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1.

7
8 Listing and Labeling: Provide electrically operated components specified in this Section that
9 are listed and labeled.

10
11 The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

12
13 Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
14 Laboratory" as defined in OSHA Regulation 1910.7.

15
16 Comply with NFPA 70 - National Electrical Code.

17
18 Manufacturers: Firms regularly engaged in manufacture of heating and cooling systems of
19 types and sizes required and whose products have been in satisfactory use in similar service.
20 Equipment shall be as specified or approved equal.

21
22 DELIVERY, STORAGE, AND HANDLING:

23
24 Deliver: Deliver heating and cooling system and other equipment furnished in this section in
25 factory wrapped containers. Coordinate delivery of units in sufficient time to allow
26 movement into/onto structure.

27
28 Store: Store heating and cooling system and other equipment furnished in this section in
29 clean dry space; protect from dirt, fumes, water, and construction traffic.

30
31 Handle: Handle equipment furnished in this section carefully to avoid damage to components
32 and finish. Protect finish during installation. Do not install damaged equipment; replace
33 damaged parts or equipment and remove them from project site. Handle units to comply
34 with manufacturer's written rigging and installation instructions for unloading and moving to
35 final location.

36
37 WARRANTY:

38
39 General Warranty: The special warranty specified in this Article shall not deprive the
40 Contractor of other rights the Contractor may have under other provisions of the Subcontract
41 Documents and shall be in addition to, and run concurrent with, other warranties made by the
42 Subcontractor under requirements of the Subcontract Documents.

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MANUFACTURERS: Firms regularly engaged in manufacture of heating and cooling systems of types and sizes required and whose products have been in satisfactory use in similar service. Equipment shall be as specified on Subcontract drawings.

Fan Belts: One set for each belt-drive fan system installed.

EQUIPMENT:

PART 3--EXECUTION

Setting: All equipment shall be installed in conformance with the manufacturer's recommendations and set in proper alignment. Each item shall be leveled and adjusted for proper height by means of leveling bolts, plates, and/or shims. Equipment supports shall be independent of associated piping, component brackets, and supports or other similar attachments.

Alignment: All new rotating equipment shall be aligned and balanced in accordance with the recommendations of the manufacturer of the equipment. The alignment of all mechanical drives shall be checked and demonstrated to be within the manufacturer's recommended tolerances. The Subcontractor shall arrange with the manufacturer for correcting defective alignments, if any, and shall follow recommendations of manufacturer for correction.

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1 FIELD QUALITY CONTROL:
2

3 Subcontractor Supplied Testing: The Subcontractor shall engage an agent or firm that is
4 qualified to perform the following tests on the completed HVAC system. Tests shall be
5 performed at no additional cost to the Contractor.
6

7 Testing, Adjusting and Balancing: HVAC tests shall comply with National Air Balance
8 Bureau or Associated Air Balance Council Standards and in accordance with ASHRAEs and
9 SMACNA recommendations pertaining to measurements, tolerances, instruments and testing,
10 noise criteria, adjusting and balancing. See Testing, Adjusting and Balancing Section of this
11 specification.
12

13 Subcontractor Inspection: The work shall be inspected and tested by the Subcontractor to
14 verify compliance with the Subcontract drawings and specifications.
15

16 Contractor Surveillance: Surveillance will be performed by the Contractor to verify
17 compliance of the work to the Subcontract drawings and specifications.
18

19 END SECTION 15800

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1 SECTION 15883--HEPA FILTER HOUSINGS

2
3 PART 1--GENERAL

4
5 WORK DESCRIPTION:

6
7 This specification covers the design, fabrication, inspection, testing, cleaning, and shipment of a HEPA
8 filter housing. The housing shall be a bag-out, side access unit, consisting of one rack for 24 x 24 x 2 in.
9 prefilters, and one rack for 24 x 24 x 11½ in. fluid seal HEPA filters.

10
11 WORK INCLUDED: Work includes, but is not limited to:

12
13 Test, furnish and install HEPA filter housings meeting the requirements in these specifications
14 and to the configurations shown on the subcontract drawings

15
16 Install Government furnished HEPA filters and prefilters

17
18 Furnish and install differential pressure gage, switch and instrument tubing.

19
20 Coordinate the installation of HEPA filter units with the Air Distribution System Section 15800.

21
22 QUALITY CONTROL:

23
24 Design: HEPA filter housing design shall conform to ANSI N509 and ERDA 76-21, Nuclear Air
25 Cleaning Handbook.

26
27 Inspection: All equipment furnished in accordance with this specification will be subject to inspection
28 by the Contractor's Representative during any phase of fabrication or testing.

29
30 SUBMITTALS:

31
32 TBD

33
34 DELIVERY, STORAGE, AND HANDLING:

35
36 All components shall be packaged to prevent damage and the entry of dirt or moisture during shipping
37 and outdoor storage for a six month period.

38
39 PART 2--PRODUCTS

40
41 HEPA FILTER HOUSINGS:

42
43 Filter housings shall be fabricated of 14 gage, type 304, 304L, 316 or 316L stainless steel, for an int
44 pressure of 10 in. w.g. and UBC Seismic Zone III. The design shall meet ANSI N509 and ERDA 76

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1 The housing shall be a side-servicing bank type arrangement that does not require the air to change
2 direction through the housing or as it enters or exits the housing. All joints and seams shall be welded
3 airtight and ground smooth. The unit shall be free of all burrs and sharp edges. All mechanical
4 components and filter slide plates shall be 300 series stainless steel.
5

6 Filter housings with multiple filters shall have removal rods to draw the filters to the bag-out position.
7 Filter housings shall have locking arms in each tier to operate the mechanism, which engages and
8 disengages the filters on the internal mounting frame. This mechanism shall be such that it will transmit
9 a positive force on both the top and bottom edge of each filter to prevent tipping or binding of the filters
10 as they are pulled into or away from the knife edge seal. Both the removal rod and the locking arm shall
11 be operated through the polyvinyl bag identified in Section 2.2.3.8.
12

13 The filter housings shall have a removable access door and bag-out port for each tier of filters and a
14 separate access door for prefilters. There shall be four tie down latches per access door and they shall be
15 spring loaded in such a manner that they pivot away from the bag-out port after release, so that they do
16 not impede the bag-out process. The filter locking arm and access door shall interface in such a manner
17 that the door cannot be closed until the filters are correctly seated in the housing and sealed to the
18 mounting frame.
19

20 Doors shall be fitted with closed cell neoprene gaskets in accordance with ASTM-D1056, Grade SCE-
43. The gasket shall be mounted to the door (as opposed to the housing) and shall be manually
replaceable (after door has been removed).
23

24 On the upstream side of each filter position there shall be a smooth inlet design that provides a minimum
25 3/4 in. depth recess around the upstream perimeter of the filter to limit the buildup of contaminants in
26 crevasses or fillets that would have been caused by the junction of the filter's integral frame and the
27 housing wall. All flanges of the housing that connect to the system shall turn to the outside.
28

29 The filter-to-frame seal in each filter housing shall be effected by means of a continuous knife edge on
30 the mounting frame that mates to a continuous perimeter channel on the face of the filter which has been
31 filled with a viscous, non-drying fluid. The knife edge seal frame shall be square to within $\pm 1/16$ in.
32

33 The filter housing shall be designed to fit fluid seal HEPA filters (24 x 24 x 11½ in.), which are
34 Government furnished.

35 Each filter housing access door shall have a bag-out port inside the door that has been hemmed on its
36 outer edge to prevent tearing of the bag. There shall be two continuous ribs on the outside of the port to
37 hold the bag's elastic shock cord and the safety strap during the bag-out operation.
38

39 One PVC bag shall be furnished for each access door on each filter housing. It shall be 0.008 in. thick,
40 amber in color with a transparent, smooth textured finish, and shall have an elastic shock cord hemmed
41 into the mouth of the bag for a firm fit when stretched around the bag-out port. A stock number shall be
42 provided with the bag.

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1 A nylon safety strap shall be provided with each bag-out port to prevent the bag from slipping off during
2 the bag-out procedure. The strap shall have a neoprene laminate on one side to prevent slippage. A
3 cinching strap shall also be provided with each bag-out port to tie off the slack in the bag while the
4 ventilation system is operating.

5
6 Each door shall be equipped with an exterior metal pocket for the filter housing instruction manual
7 which shall be provided at the same time the housing is delivered and shall contain complete, detailed
8 and separate instructions on filter arrangement including installation, operation, maintenance, and spare
9 parts. The manual shall be contained in weatherproof bags.

10
11 For DOP test sections, all filter testing shall be able to be conducted from a location outside of the
12 system using apparatus and devices which are supplied as an integral part of the test sections including
13 mixing devices and sample ports. The upstream and downstream test chambers shall contain identical
14 mixing devices to mix and disperse a uniform challenge air/aerosol ahead of each filter, and sample the
15 effluent upstream and downstream of the filter being tested. Challenge aerosol inlet ports and upstream
16 and downstream sample ports shall be provided for each HEPA filter. The pressure drop across each test
17 section shall be no greater than 0.25 in. w.g. (at 1000 cfm per filter) during the test. All mixing devices
18 shall be designed to swing aside when testing has been completed.

19
20 The in place testing design shall be proof tested in a multiple filter. It shall be shown that the leaking
21 filters can escape detection in the conventional ten duct diameter test wherein the entire bank is
22 challenged, but that they can be "found" by the individual efficiency test. The proof test shall include
23 four test arrangements using various plenum and transition pieces for a comparison of efficiency
24 readings under different conditions. All efficiency readings shall be accompanied by upstream sample
25 readings taken at a minimum of fifteen points ahead of each filter on three planes. The combined
26 assembly including filter housing and test sections shall be the product of a single manufacturer.

27
28 DOP test section challenge aerosol inlets shall be 1 in. IPS, Schedule 40, Type 304 stainless steel.
29 Sample ports shall be ½ in. IPS, Schedule 40 Type 304 stainless steel. These connections shall be
30 provided with Type 304 stainless steel pipe caps.

31
32 The filter housing shall be provided with flanges for connecting to the ductwork transition pieces.
33 Furnish the required gaskets.

34
35 Static pressure ports shall be located on top of the housing upstream and downstream of the prefilters
36 and filters. Connections shall be 1/4 in. pipe nipple with cap.

37
38 Instrument Tubing: Tubing shall be stainless steel Type TP304 per ASTM A269. Fittings shall be
39 compression type and shall be Swagelok or approved equal.

40
41 Differential Pressure Gauge: The gauge shall be diaphragm actuated, shall have 3-7/8 in. diameter white
42 dial with black figures and graduations, shall have pointer zero adjustment and shall be furnished
43 complete with two static pressure taps, fittings for 1/4 in. metal tubing and means for mounting the

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gauge. Gauge shall be Magnahelic No. 2003-AF reading to 0-3 in. water, in 0.10 in. divisions as manufactured by Dwyer Instruments, Inc., or approved equal.

Differential Pressure Switch: Differential pressure switches shall be diaphragm operated to actuate two single pole double throw snap switch. Motion of the diaphragm shall be restrained by a calibrated spring that can be adjusted to set the exact pressure differential at which the electrical switch will be actuated. Motion of the diaphragm shall be transmitted to the switch button by means of a direct mechanical linkage operating range of the switches shall be 0.5 to 6.0 in. of water. Switches shall be Dwyer Instruments, Inc., Catalog No. 1627-5 or approved equal.

PART 3--EXECUTION

INSTALLATION:

Installation of Equipment: All equipment shall be installed in conformance with the manufacturer's recommendations, this specification and the drawings. Each unit shall be leveled and adjusted for proper height by means of leveling bolts, plates and/or shims. Equipment supports shall be independent of associated piping and ductwork, component brackets and supports or other similar attachments.

Filters (GFE): The high efficiency HEPA filters for installation in the filter housings will be furnished by the Government but shall be installed by the Subcontractor in accordance with the subcontract drawings and these specifications.

QUALITY CONTROL TESTING:

Subcontractor Supplied Testing:

General: A housing leak test and an in-place DOP test are required.

Test programs and procedures shall be submitted for the housing leak test and filter fit test specifying test to be performed, the acceptance criteria, and time schedule of testing. Tests shall be made only by persons who have demonstrated their competence to satisfactorily make the specific test and certified in accordance with ANSI N510-1980, N509, and ERDA 76-21.

Housing Leak Test: The test is used to verify the leak integrity of the filter housing assembly. The presence of leaks is disclosed by a pressure decay test to be conducted prior to shipment from the factory. In this test the housing shall be blanked off at the inlet and the outlet and shall be tested by the pressure decay method in accordance with ANSI N510-1980 to 10 in. w.g. as specified in Table 4-4. Following this test, each filter position shall be fitted with an airtight filter-shaped plug and the housing knife edge shall be tested by the pressure decay message in accordance with ANSI N509-1980 to 10 in. w.g. as specified in ANSI N509-1980, Table 4-4.

If the presence of leaks is shown, the leaks are then located by the bubble method and repaired after which the housing is retested by the pressure decay method. A leak indication is any bubble 1/16 in.

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(0.06 in.) diameter that forms in 1 second, or a bubble 9/32 in. (0.28 in.) that forms in 1 min. Tests shall be performed in accordance with ANSI/ASME N510, Paragraph 6.

Test reports shall be submitted for approval following testing. Failed tests and necessary repairs shall also be reported and identified as to location.

Filter Fit Test: After fabrication, each of the filter housings shall be tested for filter fit. HEPA filters, of type Flanders Model No. T-007-0-02-05 NU Size GG-F (dimensions of 24 x 24 x 11-1/2 in.), shall be placed in each of the filter housings. After the filter elements are in place, visual inspection shall confirm that the elements fit without binding and that the seal is completed.

In-Place DOP Test: The in-place DOP test shall be performed by others after the filters are installed. Penetration shall be limited to the 0.03 percent and, if exceeded, the filters must be resealed and retested until an efficiency of 99.97 has been achieved. The Subcontractor shall furnish all labor and materials required should resealing of the filters be required.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Contractor's Representative to verify compliance of the work to the drawings and specifications.

END OF SECTION 15883

Appendix B

CONTRACTOR'S MATERIAL & TEST CERTIFICATE

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR ABOVEGROUND PIPING

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A _____ ate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood that the _____'s representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Property Name	Date
---------------	------

Property Address

PLANS	Accepted by approving authorities (names)					
	Address					
	Installation conforms to accepted plans Equipment used is approved. If no, explain deviation					<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO

INSTRUCTIONS	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain					<input type="checkbox"/> YES <input type="checkbox"/> NO
	Have copies of the following been left on the premises: 1. System Components Instructions 2. Care and Maintenance Instructions 3. NFPA 25					<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO

LOCATION OF SYSTEM	Supplies Buildings
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SPRINKLERS	Make	Model	Year of Manufacture	Orifice Size	Quantity	Temperature Rating

PIPE AND FITTINGS	Type of Pipe Type of Fittings
--------------------------	----------------------------------

ALARM VALVE OR FLOW INDICATOR	Alarm Device					Maximum Time to Operate Through Test Connection	
	Type	Make	Model	Minutes	Seconds		

DRY PIPE OPERATING TEST	Dry Valve					Q.O.D.				
	Make	Model	Serial No.	Make	Model	Serial No.				
	Time to Trip Thru Test Connection*		Water Pressure	Air Pressure	Trip Point Air Pressure	Time Water Reached Test Outlet*		Alarm Operated Properly		
	Min	Sec	psi	psi	psi	Min	Sec	Yes	No	
	Without Q.O.D.									
With Q.O.D.										
If no, explain										

DELUGE & PREACTION VALVES	Operation <input type="checkbox"/> Pneumatic <input type="checkbox"/> Electric <input type="checkbox"/> Hydraulic									
	Piping Supervised <input type="checkbox"/> YES <input type="checkbox"/> NO					Detecting media supervised <input type="checkbox"/> YES <input type="checkbox"/> NO				
	Does valve operate from the manual trip and/or remote control stations <input type="checkbox"/> YES <input type="checkbox"/> NO									

*Measured from time inspector's test connection is opened.

DELUGE & PREACTION VALVES (continued)	Is there an accessible facility in each circuit for testing <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, explain			
	Make	Model	Does Each Circuit Operate Supervision Loss Alarm		Does Each Circuit Operate Valve Release		Maximum Time to Operate Release	
			Yes	No	Yes	No	Min	Sec
PRESSURE REDUCING VALVE TEST	Location & Floor	Make & Model	Setting	Static Pressure		Residual Pressure (Flowing)		
				Inlet (PSI)	Outlet (PSI)	Inlet (PSI)	Outlet (PSI)	Flow (GPM)
TEST DESCRIPTION	<p><u>Hydrostatic</u>: Hydrostatic test shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.</p> <p><u>Pneumatic</u>: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop, which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.</p>							
TESTS	All piping hydrostatically tested at ___ psi for ___ hrs.				If no, state reason			
	Dry piping pneumatically tested <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Equipment operates properly <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Do you certify as the Sprinkler Contractor that additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Drain Test	Reading of gage located near water supply test connection: ___ psi			Residual pressure with valve in test connection open wide ___ psi.			
BLANK TESTING GASKETS	Underground mains and lead in connections to system risers flushed before connection made to sprinkler piping.			Explain				
	Verified by copy of the U Form No. 85B <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Flushed by installer of underground sprinkler piping <input type="checkbox"/> YES <input type="checkbox"/> NO							
	If powder driven fasteners are used in concrete, <input type="checkbox"/> YES <input type="checkbox"/> NO has representative sample testing been satisfactorily completed						If no, explain	
WELDING	Welded Piping <input type="checkbox"/> YES <input type="checkbox"/> NO			If Yes...				
	Do you certify as the Sprinkler Contractor that welding procedures comply with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES <input type="checkbox"/> NO	
	Do you certify that the welding as performed by welders qualified in compliance with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES <input type="checkbox"/> NO	
	Do you certify that welding was carried out in compliance with a documented quality control procedure to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residue are removed, and that the internal diameters of piping are not penetrated						<input type="checkbox"/> YES <input type="checkbox"/> NO	
CUTOUTS (DISCS)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? <input type="checkbox"/> YES <input type="checkbox"/> NO							
HYDRAULIC DATA NAMEPLATE	Name Plate Provided <input type="checkbox"/> YES <input type="checkbox"/> NO			If no, explain				
REMARKS	Date left in service with all control valves open:							
SIGNATURES	Name of Sprinkler contractor							
	Tests Witnessed By							
	For Property Owner (Signed)			Title			Date	
	For Sprinkler Contractor (Signed)			Title			Date	
Additional Explanation and Notes								